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Educational Research Bulletin

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Vol. X
No. 7

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Educational Research Bulletin

APRIL 1, 1931
VOL. X, No. 7

Determining Essential Apparatus

By T. C. HOLY AND D. H. SUTTON

THE persons directly in charge of purchasing equipment for the high-school sciences must determine in some manner how the fund available for purchasing laboratory apparatus is to be expended. Since the funds for this purpose are so often limited, it becomes doubly important to select only such apparatus as will contribute most to the pupil's acquaintance with the major facts and principles in the different fields of science and, at the same time, encourage him to apply scientific methods in solving the many other problems which daily confront him.

The need of a list of science apparatus with the items arranged in the order of their importance becomes more apparent when one considers the variation in the amount of money available for identical purposes in the different high schools. For example, it has been found in another study of approximately one hundred fifty school buildings erected in Ohio during 1930, that the amounts available for equipment including apparatus ranged from practically nothing to from 12 to 15 per cent of the total cost of construction. In the case of those buildings with such a limited amount of money for apparatus, selecting the most essential items becomes imperative.

An analysis of the equipment inventories, which include science apparatus, recently taken by the Ohio Department of Education in approximately six hundred school districts, indicates a shortage of science equipment and apparatus, particularly in the smaller high schools. On the other hand, an inspection of many of these same schools will reveal a large amount of apparatus which is not being used. A case in point is a high school visited last year in which three large boxes of apparatus were found stored in a small tower room. On inquiry from the janitor, it was learned that the boxes, though

they had been there for at least three years, had never been opened. The failure to use the apparatus may not have been due entirely to poor selection, but the fact remains that in terms of use, public funds had been unwisely expended. This case may be somewhat unusual, but it certainly is not uncommon to find expensive pieces of apparatus stored on the top shelves of laboratory cases and covered with the dust of more than one year's accumulation.

In general, there seems to be three common methods of determining the items of science apparatus to be purchased; selection by an administrative officer, namely, a superintendent or principal assisted by the architect and representatives of equipment companies; selection by a committee of the science teachers or heads of the science departments; and selection from lists prepared by state departments of education.

The urgent need for some objective data upon the relative importance of the items of science apparatus was emphasized by the analysis of the inventories just mentioned, together with the wide variations in the funds available in different high schools for the same purposes. The State Department of Education in co-operation with the Bureau of Educational Research of Ohio State University has undertaken a revision of the apparatus requirements necessary to conduct a class of twenty-four pupils in each of the four major high-school sciences. In the discussion which follows, the method is given which was used in making the revision, the results of which will later be made available.

THE first step was an analysis of all the items included in the recommended standard requirements of the different state departments of education. To the analysis of the recommended lists of the thirty-one state departments which prepare such lists was added an analysis of the apparatus required in the laboratory manuals for leading textbooks in each of the four major science fields. These included a total of eight laboratory manuals for textbooks in physics, five in general science, and four each in chemistry and biology.

The analyses of the apparatus lists in each of these sciences were grouped under two major types, individual and general. Under "individual apparatus" is included the items to be supplied to each pupil for performing individual laboratory

exercises, while under "general" is included the items utilized by the teacher or a small group of pupils in demonstrating those experiments not assigned to each pupil.

THE final apparatus lists as obtained from the state department requirements, laboratory manuals of the leading textbooks in the four major science fields included a total of 168 items of general apparatus and 111 items of individual apparatus in chemistry; 380 general and 333 individual in physics; 148 general and 72 individual in biology; and 181 general and 109 individual in general science.

From these original lists, a check list for the items of general and individual apparatus was composed. In order that the check lists should contain a sufficient number of items to provide a perspective of the entire field of each science, all items listed in 20 per cent or more of the sources analyzed was included in the lists sent to teachers to be checked. This figure, arbitrarily selected, was thought to represent a point below which the items need not be included in the check list. To offset this, blank spaces were provided on the lists for teachers to add any items thought necessary. By omitting the items appearing in less than 20 per cent of the sources analyzed, the individual and general lists were reduced as follows:

	Reduced
Chemistry—	
General	168 to 75
Individual	111 to 80
Physics—	
General	380 to 167
Individual	333 to 184
Biology—	
General	148 to 67
Individual	72 to 35
General Science—	
General	181 to 77
Individual	109 to 77

Having secured a somewhat comprehensive list of the items of science apparatus, the next step was to determine the relative importance of each item. It seemed that those who should be most familiar with the needs and problems in the field of laboratory apparatus were the teachers actually utilizing the apparatus. Consequently, they were selected to check the items of apparatus in each of the fields.

In order to secure teachers in each of the four major

high-school sciences carefully selected and widely distributed, a letter was sent to each of the forty-eight state school officials requesting them to recommend those whom they considered to be the outstanding teachers within the state in each of the major science fields. The number of teachers from each state was allocated in the same ratio as the high-school enrollment within the state was to the high-school enrollment of the United States. The lists submitted by the state departments were, with but few exceptions, composed of teachers who were teaching but one of the four sciences.

Thirty-five states co-operated in the project by submitting names of the outstanding teachers in each of the four science fields. Names and accurate addresses were furnished by these states for 286 teachers of chemistry, 251 teachers of physics,

TABLE I

DISPOSITION OF CHECK LISTS SUBMITTED TO TEACHERS OF BIOLOGY, PHYSICS, CHEMISTRY, AND GENERAL SCIENCE IN THIRTY-FIVE STATES

SUBJECTS	TOTAL NUMBER OF CHECK LISTS OF SCIENCE APPARATUS			
	Submitted	Returned	Usable	Per Cent Submitted Used in Final Checking
Biology	273	211	207	76
Chemistry	286	228	224	78
General Science .	219	194	183	84
Physics	251	208	203	81

273 teachers of biology, and 219 teachers of general science. The tabulated list of apparatus for each science was then submitted to the teachers of that science with the request that each individual item of laboratory equipment be checked as *necessary, desirable,* or *unnecessary* in teaching the respective science.

The total number of check lists submitted in each field together with the number of usable replies and the percentage of check lists returned which were checked with sufficient accuracy so that they could be tabulated are shown in Table I. The difference between the numbers appearing under the columns *returned* and *usable* represent the total number of check lists returned which were not tabulated. There was a total of 24 such lists, 4 each in biology and chemistry, 11 in general science, and 5 in physics. It will be noted in Table I that replies were received from 76 per cent of the persons to whom

the biology lists were sent. Seventy-eight per cent of the persons receiving the chemistry lists checked and returned them. Eighty-one per cent of the physics apparatus lists were checked and returned, while 84 per cent of those receiving the check

TABLE II

PERSONNEL OF THOSE CHECKING EQUIPMENT LISTS IN CHEMISTRY AND PHYSICS

STATE	CHEMISTRY			PHYSICS		
	High-School Teachers	High-School Supervisors	College Teachers	High-School Teachers	High-School Supervisors	College Teachers
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Alabama	3	1	1	1	1	.....
Arkansas	3	1	.....	4	1	.....
California	16	3	2	15	2	1
Connecticut	1	1	.....	2	1	.....
Delaware	2	1	.....	1	.....	.....
Idaho	4	.....	.....	2	1	.....
Indiana	15	5	.....	8	5	2
Iowa	3	1	1	6	3	1
Kansas	5	2	2	4	3	1
Kentucky	3	2	1	2	1	1
Louisiana	3	3	.....	3	2	1
Maine	3	1	.....	1	1	.....
Maryland	.....	.....	.....	2	1	.....
Massachusetts	1	.....	.....	2	4	2
Michigan	6	3	1	6	2	1
Minnesota	1	1	.....	9	3	2
Mississippi	1	1	1	2	.....	.....
Nebraska	1	.....	.....	2	1	.....
New Hampshire	3	2	.....	2	1	.....
New Jersey	6	3	.....	4	3	.....
New Mexico	.....	2	.....	1	1	1
North Carolina	8	3	.....	2	.....	.....
Ohio	21	15	.....	20	15	.....
Oregon	1	2	1	2	2	1
Pennsylvania	.....	.....	.....	1	.....	.....
Rhode Island	2	2	.....	2	2	.....
South Dakota	2	1	1	2	.....	.....
Texas	6	3	4	5	1	2
Utah	1	1	.....	.....	.....	.....
Vermont	1	1	.....	1	.....	.....
Virginia	4	1	.....	2	1	1
Washington	6	1	1	4	1	.....
West Virginia	1	1	.....	.....	.....	.....
Wisconsin	4	1	.....	3	3	1
Wyoming	2	2	.....	.....	.....	.....
Total	140	68	16	123	62	18

lists in general science submitted replies which could be used.

The persons who co-operated in the different groups by checking the lists of apparatus are shown in Table II. The greatest number of replies which could be used in the final tabulation were received from those persons who checked the

lists in chemistry. A total of 140 teachers, 68 supervisors or department heads, and 16 college or university teachers of chemistry made replies sufficiently clear to warrant their inclusion in the tabulation. In some instances, the exact title or

TABLE II *(Continued)*

PERSONNEL OF THOSE CHECKING EQUIPMENT LISTS IN BIOLOGY AND GENERAL SCIENCE

STATE	BIOLOGY			GENERAL SCIENCE		
	High-School Teachers	High-School Supervisors	College Teachers	High-School Teachers	High-School Supervisors	College Teachers
	(8)	(9)	(10)	(11)	(12)	(13)
Alabama	.....	.....	.....	2	.....	.....
Arkansas	3	1	.....	3	.....	.....
California	11	4	2	16	2	.....
Connecticut	1	.....	.....	2	.....	.....
Delaware	2	.....	.....	.....	.....	.....
Idaho	1	.....	.....	1	.....	.....
Indiana	11	4	1	8	.....	.....
Iowa	2	1	.....	4	.....	.....
Kansas	5	2	1	5	.....	.....
Kentucky	2	3	1	7	.....	.....
Louisiana	1	2	1	4	1	.....
Maine	1	3	.....	5	.....	.....
Maryland	2	2	.....	3	.....	.....
Massachusetts	2	.....	.....	3	.....	.....
Michigan	10	.....	2	10	.....	.....
Minnesota	8	3	2	8	3	.....
Mississippi	1	1	.....	3	.....	.....
Nebraska	1	1	1	5	.....	.....
New Hampshire	2	2	.....	3	.....	.....
New Jersey	3	4	2	5	.....	.....
New Mexico	1	1	1	4	.....	.....
North Carolina	2	3	1	9	.....	.....
Ohio	20	11	.....	20	2	.....
Oregon	1	2	.....	3	.....	.....
Pennsylvania	.....	.....	.....	.....	.....	.....
Rhode Island	3	.....	.....	3	.....	.....
South Dakota	2	2	.....	3	.....	.....
Texas	3	4	4	10	1	.....
Utah	3	2	.....	1	.....	.....
Vermont	2	1	.....	2	.....	.....
Virginia	3	2	.....	4	1	.....
Washington	4	1	1	5	.....	.....
West Virginia	3	1	.....	2	.....	.....
Wisconsin	4	1	1	5	1	.....
Wyoming	1	1	.....	3	1	.....
Total	121	65	21	171	12	.....

position of the individual who checked the lists was not distinct. In this event, his name was included under Item 1 as teacher.

It is further noted from this table that the personnel of those checking the lists of apparatus in the different sciences represents many of the phases of the teaching fields. Those

checking the lists represent high-school teachers, supervisors, and departmental heads in each of the sciences; teachers of the four sciences in junior colleges, colleges, teachers' colleges, and universities with the exception of the lists in general science. In this one field, only the names of teachers in high schools were submitted. The total of Columns 1, 2, and 3, appearing in Table II, corresponds to Column 3 in Table I. These totals indicate the entire number of check lists returned by all persons which were clear enough to be included in the final tabulation.

THE next phase of the study after the returned lists were tabulated was to calculate the percentage of the total number of individuals who considered each particular item *necessary*, *desirable*, or *unnecessary*. The percentage assigned to each individual item of apparatus was secured by dividing the number of tabulations listing the particular item as *necessary* by the total number of usable check lists returned in the respective subject. After the percentages were calculated for each individual item, the item for each science was arranged in descending order, the rank of the items being determined by the percentage of the total number of individuals checking the item as *necessary*. These lists of apparatus considered essential in teaching biology, chemistry, general science, and physics in high school have now been submitted to the leading science equipment companies requesting them to submit prices for both individual and general items which all have agreed to do. The averages of the prices, as submitted by these companies, will then be calculated for each single item and also for the total number required of each. The cumulative averages of the prices as submitted by these four companies will then be arranged in the same order as the apparatus lists. It is believed that the arrangement of the items in descending order based on the percentage of science teachers checking as essential together with cumulative prices likewise arranged will be of considerable value to all school districts purchasing science apparatus and particularly so to those whose fund will not permit the purchase of the entire list. The plan followed in the study will enable any school district to apply the amount of money which may be available for science apparatus to those items considered most essential by the outstanding science teachers in the United

[*Continued on page 196*]

School Budget Hearings in Ohio

By H. A. FANKHAUSER

HAVE the people of Ohio taken advantage of their opportunity to share in the making of the school budget, or are they uninterested in how the money is appropriated and spent? After attending forty-four public hearings on the school budget, at which not a single person other than school officials was present, the writer has undertaken a study to ascertain whether this condition is general throughout the state.

The Ohio State Legislature in 1925 passed a law requiring all fiscal bodies of the state to adopt a tentative budget, then to advertise a date for a public hearing on it before its final adoption. From the time this law was enacted to 1929, the writer has attended in an official way forty-four public hearings on school budgets, held by fifteen different boards of education. At none of these hearings was a single person other than school officials present. This study was undertaken for the purpose of finding out whether the same conditions prevail in other parts of the state. The intent of the law is to give the people a voice in the making of the budget and the expenditure of public funds. Have they taken advantage of this opportunity, or are they not interested in how the money is appropriated and spent?

Section 5625–22 of the *General Code of Ohio* reads as follows:

> The budget of each subdivision shall include such other information as shall be prescribed by the bureau. At least two copies of the budget shall be filed in the office of the fiscal officer of the subdivision for public inspection not less than ten days before its adoption by the taxing authority, and such taxing authority shall hold at least one public hearing thereon, of which public notice shall be given at least ten days previous to the date of hearing in one official publication of such subdivision or in a newspaper having a general circulation in the subdivision.

Section 5625–20 fixes the last date upon which this hearing may be legally held as July fifteenth of each year.

To find how the law is operating, a questionnaire was sent to the clerks of all the cities, exempted villages, and two hundred rural districts. In the rural districts two were selected from each county with enough additional districts to complete the two hundred. Replies came from all parts of the state.

In the cities they ranged from the largest cities down to those with a population just large enough to "get under the wire" as a city; in the exempted villages, replies came from all sections; and in the rural districts, at least, one reply was received from each county. The questionnaire was answered by 52 per cent of the cities addressed, by 57 per cent of the exempted villages, and by 56 per cent of the rural districts.

The questionnaire asked for the following information: the date set for the public hearing; the manner in which the hearing was advertised; a copy of the advertisement; the cost; the number of people other than school officials who attended the hearing; changes made in the budget as a result of the hearing; whether the law requiring budget hearings should be changed;

TABLE I

DATE OF SCHOOL BUDGET HEARINGS (1929)

Date	Cities	Villages	Rural	Total
(1)	(2)	(3)	(4)	(5)
June 1 to 15	.....	.....	1	1
June 16 to 30	.....	.....	1	1
July 1 to 15	17	12	40	69
July 16 to 31	18	6	19	43
August 1 to 15	1	4	10	15
August 16 to 31	1	2	4	7
September 1 to 15	1	.....	3	4
September 16 to 30	1	.....	.....	1
October 1 to 15	1	.....	1	2
No reply[a]	9	5	33	47

[a] "No reply" means that this question was not answered in the questionnaire.

and, if it should not be changed, how to get the people to attend the public hearing. The law specifies that the hearing shall be held not later than July 15 of each year, and shall be advertised for a period of ten days. We find that this date is not always adhered to, and that the advertising is not always according to law. Table I shows when the hearings were held. In only seventy-one districts were the hearings held before the dead-line specified by law, and several were held three months after that date. Whether the hearings of the 47 districts which did not answer this part of the questionnaire were held on time is not known.

All of the cities and exempted villages advertised the hearings as required, while 82 of the rural districts advertised in a

newspaper of general circulation in the district, 22 posted notices of the hearing, and 8 made no publication.

The form of the advertisement is nearly the same in all cases. It states the time for the hearing, place where the meeting will be held, and where the tentative budget is on file. This is not enough information for the advertisement. It should contain the amount of the budget and a brief itemized account. A frank and clear statement of the needs of the school would also be helpful. This will tend to create public interest and confidence, and to disarm criticism in advance—the intention of the law. The problem is to create an interest in school

TABLE II

COST OF ADVERTISING THE SCHOOL BUDGET HEARING

Cost	Cities	Villages	Rural	Total
(1)	(2)	(3)	(4)	(5)
$10.00	1	.....	.....	1
6.00	1	1	.....	2
5.00	.....	.....	.....	.....
4.00	1	1	.....	2
3.00	25	14	12	51
2.50	10	.....	8	18
2.00	1	8	24	33
1.50	3	.....	1	4
1.00	.....	5	5	10
.50	.....	.....	28	28
No charge	7	.....	34	41

finances and budget-making. If we can find a way to inform the public, we stand a better chance of getting what is needed when the county budget commission examines the school budget in an effort to cut expenses. The support of an informed public is vital at this stage.

The cost of advertising the hearing is nominal. It amounted to only $321 for the 149 districts reporting, or about $2.15 on the average. The highest cost was $10 in one city district, and the lowest, $.50 (*see* Table II). From the angle of expense, we certainly cannot argue that the law should be repealed.

The theory of the law is that the budget is a matter of public interest, and therefore the criticisms and suggestions of the public ought to be worth having. In theory, this is good; none will deny that. It is an unfortunate state of affairs, however, when the general public does not take an interest in budget-making. How many people attended the hearings in

1929? In this study we find the following: of the 49 cities reporting, 43 had not a single person in attendance other than school officials; one had two reporters present; four had one reporter each, with no interest except to gather news; one city had an attendance of 10 persons who were interested in getting an appropriation for a school site. In the exempted villages 26 were without attendance; one had an attendance of two, interested in an appropriation for the public library; two had an attendance of one each, who looked over the budget but had no comment to make. In the rural districts, there was not a single instance in which anyone other than school officials attended. There were, also, 26 hearings advertised that were not attended by the members of the board of education. In not a single case was any change made in the budget as a result of the hearing.

THE boards of education are evidently disinterested, also, or they would follow the law more closely in arranging for the hearings on time, see that they are properly advertised, and attend the meetings themselves. Full publicity should be given to the school budget. Every taxpayer and patron of the school should be permitted and encouraged to know what is proposed and approved. It is often said that people in general take no interest in such matters, do not understand when they do, and that it is not their business to worry about such things as they have elected a board of education for that purpose. This attitude makes even more necessary full publicity, and an active attempt by school officials to create an interest.

Of the clerks answering the questionnaires as to the retention or repeal of the law, 25 per cent want it retained and 75 per cent want it repealed. Those who wish it retained say that conditions may arise in which it is desirable to have this provision so that the people may be heard. Those who want it repealed insist that there is no interest manifested by the people, therefore it is not necessary. No one has any comments as to how to interest people in the hearings—evidently very little thought has been given to it.

Certain recommendations seem desirable in view of these facts. First, the boards of education should try to create an interest in the hearings by holding them on time, by proper advertisement, and by insisting upon the presence of all the

board members. Second, the law should be retained and strengthened. The advertisements give the amounts of the budgets with the important items appearing in summary form. The headings should be such that they will be readily understood by the layman. This will give those who are interested in the budget information, so that they may appear before the board and enter into an intelligent discussion. Third, the date for making the tentative budget and holding the hearing should be advanced. The reason for this is that by the time the budget must be adopted it practically has been decided what money will be spent the next year in the way of the current expenses, and there is little chance of changing the amounts in the tentative budget. [Vol. X, No. 7]

* * *

A SPELLING test, The Guy Spelling Scales, for use in Grades II to IX has been prepared by J. Freeman Guy and published by the Public School Publishing Company. Norms for each half-grade are available and are sent with the test, but no other information about its reliability or validity has been received.

* * *

CENTERING educational supervision and medical relief for aboriginal Alaskans in Alaska instead of in the States is part of the recent program of the Office of Education. The office of the Chief of the Alaska Division has been transferred from Seattle to Juneau. During the fiscal year ending June 30, 1930, Congress granted $580,400 for education and $141,780 for medical relief. Ninety-three schools, with 195 teachers, an enrollment of 3,899, and a daily attendance of 3,029, were maintained.

An industrial boarding school is being planned for the natives of southeastern Alaska. During the present fiscal year $71,000 will be available for the projection of plans and preliminary construction. Three new day schools are also planned. A pre-school orphanage will also be included in the new program to allow for the removal of young homeless children from the industrial boarding schools.

Do High-School Students Have Difficulty with the Gas Laws?

By K. M. PERSING

OF THE many difficulties encountered by the teachers of physics and chemistry in the high school, there is probably none that is more perplexing and annoying than those met with in teaching the mathematical problems, and of these problems, the so-called "gas-law problems" may be easily placed at or near the top of the list. The difficulties met with in teaching "temperature" and "pressure" effects on gases have caused so much concern among chemistry teachers that there has been some discussion as to the advisability of eliminating these problems from the course of study. Powers has shown that only about 46 per cent of the high-school students learn how to solve this type of problem,[1] while Bennett has pointed out some pertinent facts relating to the ability of students to apply these laws of science and solve problems involving the application of the laws.[2]

This brief study was conducted in an effort to analyze the difficulties pointed out by both Powers and Bennett rather than to challenge their studies; also, to secure data on certain phases of the problem not fully covered in the other investigations. This study has been limited to gas laws involving the temperature and pressure factors, and the purpose was to show: first, the errors that are made; second, to determine how many of the errors are errors in the use of the principles of the gas laws.

The class work was conducted as usual. There was no particular change in method since it was planned to analyze the results of the regular recitation. After developing the principles of the laws and illustrating their application a technique for solving problems was developed. Perhaps one important change was made in the method of solving the problems and that was in the use of the fractional ratio instead of the two formulas,

$$PV = P.V. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$VT. = V.T \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

[1] Powers, Samuel R. *A Diagnostic Study of High-School Chemistry.* New York: Teachers College, Columbia University, 1924. viii+84 pp. (Teachers College, Columbia University, Contributions to Education, No. 149)

[2] Bennett, Julia C. "A Study of Pupil Errors in Chemistry," *Journal of Chemical Education*, IV (January, 1927), pp. 45–57.

It is not considered necessary to reproduce the details of the technique used in solving the problems. Immediately following the drill work on problems a test was administered to all classes excepting the several sections so marked in the table of results. This test included problems with temperature effect, problems with pressure effect, problems containing both 1 and 2, and problems containing 1 and 2 and aqueous tension. The students understood that in order to obtain credit for problems the results must be accurate to at least one decimal figure and preferably accurate to the second decimal figure, and that part

TABLE I

RESULTS OF TEST II

SECTIONS	NUMBER OF STUDENTS	TEST I CORRECT ANSWERS	TEST II		ERRORS			
			Correct Application of Laws	Correct Answers	Application of Charles' Law	Application of Boyle's Law	Aqueous Tension	Multiplication and Division
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A	20	16	18	15	1	1	.....	3
B	23	18	18	13	2	3	.....	5
C	20	15	17	17	1	2	.....	0
D	21	17	17	10	1	3	.....	7
E	22	17	21	15	0	1	.....	6
F	25	17	22	18	0	3	.....	4
G	23	19	19	14	2	2	.....	5
H	22	No test	18	14	1	1	1	4
I	22	No test	20	14	1	1	0	6
J	20	No test	16	12	1	2	2	4
K	17	No test	13	11	2	2	0	2
Total	235	.....	199	153	12	21	3	46

credit would not be allowed for method. The test results were tabulated, and the corrected papers returned to the students. No further teaching was done. It should be pointed out that there were a few opportunities during the work of the semester for applying the technique developed.

The next step in the investigation consisted in retesting these students after a fairly long interval, and because of distribution of students to different sections at the close of the current semester, the second test was administered just before the close of the semester, excepting in Sections H, I, J, and K. These sections were continued through the second semester with only a few changes in personnel, thus making it possible

to administer the final test after a longer interval. The time interval between the administration of the two tests was approximately fourteen weeks, except in the case of the last four sections in which no test was given immediately following the completion of the work, but was administered later during the second semester. The results are given in Table I.

A measure of the amount of time given to the study of these laws has not been a major issue, yet it may be pointed out that an appreciable saving of time may be affected by certain modifications in method and technique of solution. Data on this is not yet available as it is being assembled in connection with another phase of the study of gas-law problems. During the semester which followed, the amount of time required for class presentation was less than half that required when the study was started.

THE results of the study are contained in Table I. These data which have been collected over a period of several years are self-explanatory. An analysis of the test papers showed that the errors made in solving the problems may be grouped as follows: first, application of the principle of Charles' Law, or temperature factor; second, application of the principle of Boyle's Law, or pressure factor; third, application of correction value for aqueous tension; fourth, errors in multiplication and division. This analysis is based upon the results of the final test. It will be noted that in writing the final test the 235 students made a total of 82 errors, of which 46 were errors of multiplication and division. In other words, in the application of the principles of the laws relating to behavior of gases, of the 235 students solving the problems 199 made a correct application of the principles of the laws.

It will be noted that in several instances the total correct application of gas-law principles is greater in Test II than in Test I and is not easily explained, except to suggest that this improvement may be due to the practice effect provided by the problems, which occasionally occurred in the work following the study of gas laws. It must be remembered that no additional teaching was done after the administration of Test I.

These data suggest that there are also certain mathematical difficulties which must be considered in making an interpretation of the results of teaching these principles of science. The

question then arises as to whether or not a student who makes a correct application of the principles of the laws of science and fails on the multiplication and division should be given credit for the work. There will be no attempt made to answer this question, except to suggest that teachers will have to determine whether they are teaching science or grade-school mathematics. Certainly, every effort should be made to encourage the improvement of the simple arithmetical processes.

It seems to be apparent from a study of the data that these students were handicapped as much with mathematical difficulties as with the difficulties of applying the principles of science. Over 56 per cent of the errors were errors of multiplication and division. The achievement when checked on the basis of the correct application of the principles of the gas laws was good; 85 per cent of the students made a correct application of the principles of the laws, and it may be necessary in evaluating the results of teaching the problems involving the application of scientific principles to differentiate between a mathematically correct answer in which there has been an incorrect statement of the scientific principle. And finally, before we decide to scrap these troublesome problems in chemistry and physics a more careful evaluation of the difficulties should be made.

* * *

Two services for schools are announced by the National Geographic Society. In order to provide workable geography libraries for rural schools, special packets of ten different issues of the *National Geographic Magazine* are being prepared for 50 cents. A weekly illustrated *Geographic News Bulletin*, to be mailed out in sets of five each weekly for thirty weeks of the school year, is designed for use in geography or current-events classes. The fee for this service is 25 cents. This material may be obtained through the Society headquarters at Washington.

EDITORIAL COMMENT

Morons

MACHINERY helps the moron. As the making of shoes and of locomotives becomes more highly mechanized, the specific operations of the manufacturing process become inversely more simple and easy to perform. Most of the operations performed in building an automobile can be learned in a few hours. As the operations grow simple, they approach more and more nearly the range of ability of the moron, who then has a better chance in industry. After the operation is learned, the job is merely one of repetition of the same movements, hour by hour, and day by day. The moron has an added advantage. He likes a simple repetitious job better than does his brighter associate. In circumstances where a superior adult would go to pieces, the moron is happy.

These considerations point the way to proper curriculums for the moron. We should give tests to workers in industry to find those types of jobs which are now successfully filled by morons, for there are many of them. These jobs should then be analyzed to find the fundamental operations involved in each. The elements of these operations should then be taught to the morons in school. This would provide better curricular content than the handwork now used in special classes. The moron should be pointed toward the job which he can fill.

While machinery helps the moron, the machine age is not so favorable. As machinery becomes more complex, and as the operations required of the worker become simplified, social life increases in complexity. In this area the moron is more and more perplexed, for while his job grows simpler, living becomes more complicated. Therefore, the curriculum for the moron should include training in character development as well as vocational elements. He needs to be taught the basic social virtues and behavior patterns—industry, honesty, helpfulness, and the ability to get along with people. He has little interest in those less essential aspects of civilization, and he will do well if he learns the basic essentials. These should be isolated, simplified, and drilled into him.

Morons are more good than bad. The bad moron is the

unstable, vicious person who has not learned the simple elemental virtues. If he learns bad behavior patterns he runs wild because he is not bright enough to realize that crime gets him nothing, particularly because he is not bright enough to escape the consequences. If, on the other hand, he learns the elemental virtues thoroughly he is apt to be happier and more contented than his more intelligent fellows. It would appear, therefore, that the curriculum for the moron should strip life to its essentials, and should include the simple fundamentals of the job and of social living. It should aim directly at social and vocational behavior. Indeed, the same procedure would work very well for all types of children. W.W.C.

School Funds: Premium on Depository's Surety Bond Not to Be Paid by Board of Education—

Sections 7604 to 7608, General Code, direct boards of education to provide every two years by resolution for the deposit of any and all moneys coming into the hands of their treasurers. The depository must be selected by competitive bidding, and must be the bank which, being qualified in other respects, offers the highest rate of interest, not less than 2 per cent. The bank must furnish adequate security, either by giving a surety bond or by depositing certain classes of securities named in the statute (Op. Atty.-Gen., 1927, p. 2164). G.C. 2288–1 also permits deposit of first mortgages or bonds secured by first mortgage (Op. Atty.-Gen., 1928, p. 1868). If the bank gives a surety bond, it must bear the expense of such bond, and the board of education is not authorized to pay the premium on the bond nor to reimburse the bank for that purpose. The Attorney-General has so ruled in Opinion No. 2825, filed January 15, 1931, at the request of the State Bureau of Inspection and Supervision of Public Offices. The specific query which necessitated this opinion was the matter of the First National Bank of Bellaire as depository of the Shadyside Village School District. Having accepted a deposit of $100,000 at 4 per cent, a rate of interest greater than that paid under its existing contract with the board, and deposited an additional surety bond to cover this amount, plus an additional $70,000 in the regular account, the bank felt justified in asking the board to pay the premium of $425 on the bond, if it could be lawfully done.

READINGS

RAGUSE, FLORENCE W. "Qualitative and Quantitative Achievement in First Grade Reading," *Teachers College Record*, XXXII (February, 1931), pp. 424–36.

The 78 first-grade pupils of the East End School, Indiana, Pennsylvania, were classified for reading into a mature group, with an average I.Q. of 101, and an immature group, with an average I.Q. of 88. A reading table, labeled objects about the room, and a daily bulletin carrying news items of interest to the children stimulated the children's interest in increasing their ability to read. The objectives set by Mr. Gates in his book, *New Methods of Primary Reading*, served as guides to the teachers. Two sorts of daily reading exercises were given. The purpose of the first was to help the children to read with enjoyment of content; during the second period emphasis was put upon the development of word-mastery skills. The methods suggested by Mr. Gates were used, and the results were most satisfactory. The members of the mature group read from 36 to 14 books, with a median of 22; and the grade-scores on the three subtests of the Gates Primary Test were 3.25, 2.7, 2.5. The corresponding measures for the immature group were a median of 15 books and grade-scores of 2.37, 2.2, and 2.2. Mr. Gates commenting on the record of this year's work says, "The results obtained are among the most remarkable I have ever seen."

O'BRIEN, IDA. "A Comparison of the Use of Intensive Training and of Wide Reading in the Improvement of Reading," *Educational Method*, X (March, 1931), pp. 346–49.

This is an account of an attempt to improve the reading of a group of children in a large consolidated school in rural Connecticut. The Diagnostic Chart from the *Twenty-fourth Yearbook of the National Society for the Study of Education* was employed. The pupils of the school were divided into five reading groups, and pupils were changed from one group to another as difficulties were overcome. In terms of Forms A and B of the Stanford reading examination, the greatest gains were made neither by the brightest nor the dullest children, but by the slow-learning children with intelligence quotients ranging from 79 to 98. However, in the extensive reading program in social studies, bright children gained most.

The conclusion of the study brought these recommendations: that a system of checks and tests which would show the working level of the pupils be used; that only the minimum of mechanical training be given to bright children and wide reading programs be provided; that specific work to overcome the difficulties of the slow-learning children be provided; that individual studies of reading difficulties be made.

MILLER, JOSEPH. "Causes of Failure and Success in School," *Educational Method*, X (March, 1931), pp. 327–33.

Following the receipt of teachers' lists of the highest and lowest children, academically, in Wilkes-Barre schools, an investigation to determine the

reasons for success and failure in classroom work and to ascertain the number of mentally deficient children in Grades I to V was begun. The Pintner-Cunningham Primary Tests and National Intelligence Tests, Simon-Binet and Healy Picture Completion Tests, I and II, ratings, interviews, and teachers' opinions were employed. It was learned that 1,021 children were considered dull, 337 bright, and 200 average. Forty-five of the dull children were found to be actually mentally defective. Many significant facts about language and reading habits, physical defects, conduct and personality were learned through this study. The importance of first-grade reading was clearly emphasized.

HILLIARD, GEORGE H., AND BARNES, MARCILLENE, "The Effect of Specific Drill on Reading Ability," *Elementary School Journal*, XXXI (February, 1931), pp. 417–26.

Drill in reading planned for specific practice is effective in helping a pupil to overcome his reading difficulties according to the study here reported. Sixth-grade pupils whose composite reading scores on the four subtests of the Gates Silent Reading Tests, Form 1, were below the standard grade-score were given a daily 30-minute period of drill for ten consecutive weeks. Silent Reading with various purposes, as well as oral reading, was practiced by the experimental group each week. A control group in another school was arranged by pairing each pupil according to his reading score with a pupil having a similar score in the experimental group. The members of the control group were given no special drill and showed an actual loss on the final tests, while each child in the experimental group made a significant gain.

GORSLINE, ROBERT. "Pupils Testify to Leisure-Time Activities," *School Review*, XXXIX (March, 1931), pp. 208–12.

This article presents the results of a questionnaire study in a Montana high school to determine the leisure-time activities of its pupils. The conclusion may be drawn that the reading done by the upper-class groups is of a distinctly higher quality than that of the lower-class groups. Motion-picture attendance is frequent, averaging 1.5 times per week for the lower-class groups and 1.2 times per week for the upper-class groups. Data are also presented on other activities.

Curriculum construction in the high school must increasingly utilize data relative to the out-of-school activities of pupils. Once these have been discovered, the school must, by its training, correct important deficiencies. It becomes crucial, therefore, that the instruments used to discover these leisure-time activities be carefully validated. The extent to which questionnaires of the type used in this investigation can be substituted for diaries and other methods for securing data on leisure-time activities of pupils has not yet been determined.

GAMBLE, JOSEPH N. "The Place of Natural Science in Programs of High-School Graduates," *School Review*, XXXIX (March, 1931), pp. 177–85.

This article reports curricular practices in reference to the requirement and the election of natural science in programs of high-school graduates, and indicates the amount of sequential coherence in the courses in this area. The

evidence shows that satisfactory science sequences have not been formulated, and that science studies occupy a position of marked quantitative inferiority in comparison with foreign languages, mathematics, and social science.

In Paper Covers

TYSON, LEVERING. *Education Tunes In.* New York: American Association for Adult Education, 1930. 119 pp.

This pamphlet discusses in detail the critical problems faced by the broadcasters of educational materials. The character of the discussion is suggested by the chapter heads: "Government Control of Broadcasting," "Educators and Broadcasters, a Study of Attitudes," "Present Educational Broadcasts," "Order Out of Chaos—A Suggested Remedy," "Educational Broadcasting in Europe," "Financing Educational Broadcasting in America," "Problems for Research and Experimentation," "The Wilbur Committee and Its Work," and "A Digest of Successful Educational Broadcasts." This interesting and interpretative pamphlet presents the background necessary to an intelligent understanding of education by radio. Though written from the standpoint of adult education, much of the content is equally appropriate for other areas of education.

EDGAR DALE

DARINGER, HELEN FERN. *A Study of Style in English Composition.* New York: Teachers College, Columbia University, 1930. 56 pp.

The Daringer study aims at an analysis of the stylistic qualities of written composition. The author first lists the qualities of written expression considered excellent by such writers as Stevenson, Pater, Newman, Wendell, Baldwin, Spencer, and Lewes. She then compares these qualities with those advocated by composition textbooks used in secondary schools. Positive correlation between the opinions of writers on the subject and the elements emphasized by textbooks is discovered. Among the twenty-five textbooks used in the work there is also general agreement as to the elements of style most to be fostered in the writing of high-school pupils.

The second part of the study attempts to determine what capacity there is among competent teachers to recognize these favored qualities of style, and what agreement there is in rating them. Among the judges selected for the study the unanimity of opinion was not startling. In another respect, the findings of the judges are significant for certain well-known and successful professional writers were not accorded uniformly high rankings in the several stylistic qualities deemed by composition books as essential to good writing.

HOWARD FRANCIS SEELY

WOODY, CLIFFORD, AND BERGMAN, W. G. *Achievement and Interest of High School Seniors.* Ann Arbor, Michigan: Bureau of Educational Reference and Research, University of Michigan, 1930. 55 pp. (Bureau of Educational Reference and Research, Bulletin No. 134)

This bulletin is a report of a study of nearly one thousand high-school Seniors, boys and girls, in Michigan. Measures were made of the pupils' native capacity and school achievement. Information concerning the interests of pupils and certain socio-economic factors concerning their parents was

secured by means of the questionnaire technique. The statistical measure used in comparing the mean scores of the intelligence and achievement tests is the standard score. Groups of pupils were compared as to their like or dislike of a subject; the type of high-school course pursued; choice of a college; the proposed courses to be taken in colleges; the pupils' immediate, preferred, and probable occupations; occupation of the father; and nationality of the parents. The report is well illustrated with tables and graphs. In general, interest and achievement seem to be closely related.

FRED P. FRUTCHEY

DILL, VIRGINIA, *et al.* *Reading.* 1930. 26 pp. (Kansas City School Service Bulletin, Vol. III, No. 1)

Last year the supervisors and teachers of the schools at Kansas City co-operatively studied the problems of reading. A series of programs for the monthly meetings of the Elementary-School Principals Association was arranged. In the pamphlet here reviewed short papers selected from these programs are presented in which are discussed a progressive reading program, discovering reading difficulties, improvement of reading in the first grade, in the second and third grades, in the intermediate grades, together with the description of a form on which reading difficulties may be listed, and a program of remedial reading.

LOCKHART, EARL G. *The Attitudes of Children Toward Law.* Iowa City, Iowa: University of Iowa, 1930. 61 pp. (University of Iowa Studies. Studies in Character, No. 1)

The investigator defines the term "attitude" as "a potential act" which "may never pass over into behavior because of inhibiting factors." In order to measure the attitude of children toward laws, a test was constructed consisting of sixty questions on twenty laws familiar and of interest to children. To establish a criterion for comparison fifty lawyers of the highest rating in ability and moral character were requested to answer the test questions, thereby indicating the attitudes they thought desirable in all cases.

The self-correlation coefficient of the fifty-one questions answered the same by the 80 or more per cent of the lawyers is .837. The correct answers for the test are the answers agreed upon by 80 per cent of the lawyers. The mean score for any group of individuals is used as the statistical measure for comparison. The reliability of the difference of the mean scores of any two groups is expressed in terms of the probable error of the difference. Comparisons of mean scores were made to determine any influence of sex, grade, intelligence, socio-economic status, and direct teaching. An outstanding conclusion of the study is that there is but a very slight difference between the attitude of children toward law and that of adults.

FRED P. FRUTCHEY

RETAN, G. A., AND ROSS, B. R. "Outlines for Observation for Student Teachers." Ann Arbor, Michigan: Edwards Brothers, 1929. (Mimeographed)

This set of outlines of perhaps 60 pages is strictly an individual teaching tool. It is probably very useful in the bailiwick in which it has been devel-

oped. It does not promise, however, to have a spread of usefulness beyond that area. The 18 observation guide sheets that are included seem to represent the teaching notes of the authors on the classroom problems to which they are directed. They likewise include questions to direct the reading of students. Thus the pamphlet is more than a guide for observations; it is likewise an instrument for directing the reading of students.

The "personal" character of this collection of guide sheets is particularly apparent when one scans the readings listed in connection with each observation problem. The references given are probably adequate. They certainly are not extensive, however, and they are undoubtedly different from those another approaching the same problem would use. Others may find this publication of high value. This reader does not.

H. GORDON HULLFISH

Books to Read

McKEE, WILLIAM J. *New Schools for India.* Chapel Hill, North Carolina: University of North Carolina Press, 1930. 435 pp.

After years of study, experiment, and research in that difficult field, education for the rural population of India, Mr. McKee has given to India and the world a monumental work. "One of the most vital problems facing India today is that of providing a basic education for its teeming millions of people." It is a baffling problem which few have dared to face. The British Indian Government has barely touched it. The Nationalist has been busy with other things, with the result that decades after decades have gone, and the problem still remains unsolved. "The hungry sheep look up and are not fed."

This man conceives an idea, develops a plan, and organizes an institution at Moga, Punjab, which already, by reason of what it has been able to accomplish, is an "astonishing success" and bids fair to be "a vision and a hope of the reconstruction of primary village education in India."

It is a great work this—a masterly study of the history of education in North India. The methods now in use for village education have been thoroughly discussed, their faults and weaknesses exposed, their merits evaluated. The rural conditions, problems, and ideals of India have been given due consideration and plans suggested for developing curriculums for village education.

The present volume—another glorious chapter in the story of the brilliant work of the Christian missions in the cause of education in India—has everything in it that makes it worthy to be in the hands of everyone interested in education for the masses.

B. B. MALVEA
Head of the Department of Chemistry
Ewing Christian College, Allahabad, India

KANDEL, I. L. *History of Secondary Education, A Study in the Development of Liberal Education.* Boston: Houghton Mifflin Company, 1930. xviii+577 pp.

During the past two decades criticism of that remarkable accretion, the American high school, has become increasingly articulate. Educators have

been increasingly forced to the realization that the problem of secondary education is one we share with the Old World, that a knowledge of the experience of both Europe and America is essential to an intelligent solution of the problem. This experience Mr. Kandel summarizes in a book packed with invaluable facts. In the first part of the work he sketches the history of secondary education from the time of the Athenian republic to the eighteenth century. The last three-fifths of the book is devoted to the development of national systems in France, Germany, England, and the United States.

The objectives of secondary education and the various attempts to adapt the curriculum to the objectives constitute the dominant theme of Dr. Kandel's account. In the opinion of the reviewer no other American publication so adequately sets forth the historical background of the problem of secondary education. The final chapter is an especially valuable contribution toward the clarification of the problem.

As a textbook the work has some defects. Insufficient attention is paid to economic, social, and political influences; conversely, the influence of thinkers and reformers is considerably overrated; the astounding number of facts included makes the book rather difficult and uninteresting to read. It is possible, of course, that it is the instructor's function to interest the students.

PAUL J. FAY

COUNTS, GEORGE S. *The American Road to Culture, A Social Interpretation of Education in the United States.* New York: John Day Company, 1930. xii+194 pp.

Professor Counts is here trying to derive the theory of American education from our practice. What we believe about education must be inferred from what we do about it. That seems to be a promising thesis, but the impression made by his book upon one reader is that our beliefs can be stated only in the form of antinomies. American education, so we understand this author, exhibits the pervading influences of localism, individualism, competition, and utilitarianism. Localism in the control of schools is, however, opposed by a strong sense of governmental responsibility for education and an urgent set toward national solidarity. The popular faith in the individual and the rampantly competitive practices of our schools are met by extreme demands for social conformity, conservatism, and standardization. Together with a strong belief in the monetary value of education and a program of instruction that is highly practical goes an opposition to specialization which tends to negate this belief and program. The main thesis seems to be that the country, in changing from an agrarian to an urban and industrial civilization, cannot escape the conflicts of a transition era. It seems hardly too strong a statement that he holds that our existing educational theories are mere reflections of the social drift.

So condensed a statement must be unfair; but a book of two hundred pages dealing with American education is by a similar necessity liable to a like distortion. One must add that the author realizes the inadequacy of a philosophy of social drift; but except for occasional suggestions there is no help in the present book toward a reasoned position. Objective sociology like purely objective-anything-else may provide materials, but it cannot create.

H. G. GOOD

JAMESON, EMILY D. *Physical Education for the Preparation of General Elementary School Teachers.* New York: Teachers College, Columbia University, 1930. viii+118 pp. (Teachers College, Columbia University, Contributions to Education, No. 402)

The purpose of the study is to discover common practices in regard to organization and content of physical-education courses offered during 1926–27 to women preparing to be general elementary and junior high-school classroom teachers. The study emphasizes the organization of courses in physical education as to time allotment, course prerequisites, location of class work, formal course requirements for students, and differentiation of subject-matter. The activities offered in the courses are analyzed as to service and professionalized subject-matter.

The theory content of physical-education courses was studied and discussed on the basis of aims and values of physical education, organization of children and of facilities for physical education, and organization of activities. Besides the college classroom practice of physical-education activities and theoretical discussions relating to the teaching of such activities, three other methods were studied: observation, participation, and practice teaching.

FRED P. FRUTCHEY

MORGAN, ALEXANDER. *Makers of Scottish Education.* London: Longmans, Green and Company, 1929. ix+262 pp.

Twenty-five or more "makers of Scottish education" are considered in this book. After an introductory chapter and short sketches of some of the early Christian saints of Scotland, we come to the great humanist and reformer, George Buchanan, the tutor of Montaigne, for in his early manhood Buchanan taught in France, and later the tutor of Queen Mary and of James VIII who became James I of England. This sketch is an excellent summary of the work of Buchanan. Later subjects of the volume are John Knox, David Stow, S. S. Laurie, Andrew Carnegie, and Henry Craik. With the story of Lord Haldane, the series is brought to a close. The volume provides a convenient reference book for the lives and achievements of the great Scottish educators. There is a brief bibliography. H. G. GOOD

REAVIS, WILLIAM C., AND WOELLNER, ROBERT C. *Office Practices in Secondary Schools.* New York: Laidlaw Brothers, 1930. 239 pp.

This is the least theoretical of the several books which have been written on the subject of office practices in the secondary school. This text is based entirely on the office practices of 522 high-school principals scattered throughout the United States. The first eleven chapters are built around definite objective data, and each of the chapters presents the definite data collected from the office practices employed in the secondary schools from which answers to questionnaires were secured. The data presented in this study are classified and discussed according to the nine groups of schools, which were determined in relation to the number of pupils enrolled. The numerical importance of the office practices is determined by the frequency of their use and by the percentage of their frequencies. The last chapter is devoted to the value of frequency data in the organization and development of office practices. The authors indicate in their preface that this study has been conducted for the

primary purpose of supplying factual answers to the questions of administrative and supervisory officials regarding the office practices now in use in the secondary schools.

D. SUTTON

CLOPPER, EDWARD NICHOLAS. *Society and the Child.* Boston: Richard G. Badger, 1929. 208 pp.

Human welfare is probably the chief concern of man. Child welfare is an important phase of this main concern. Welfare success depends on both a knowledge of principles and the progressive development of standards and methods. While the literature dealing with the applied science aspects of this movement is abundant, the author notes a deficiency on the scientific side and attempts to help correct this deficiency by setting forth an outline of child-welfare philosophy.

After pointing out, in a discriminating opening chapter, the fundamental differences between principles, standards, and methods, the author moves on to consider social safety and the family, with the child in the focus of the picture. Discussions of the status of children, dependency, neglect and abuse, illegitimacy, delinquency, labor, health (mental and physical), education, play, ideals, the child's relation to the state, the children's code, and the character of social work follow.

The reviewer found the first and the last chapters most suggestive. There is little more in the rest of the book than what most intelligent and humane persons, even laymen, now take for granted, certainly nothing striking or revolutionary for the trained worker with children. The whole book, however, is a very readable presentation, and seems especially designed to help social workers keep their feet on the ground and work constructively with the total social organization in view; in other words, have a philosophy. It is interesting to find such a frank acknowledgment as this, "The true objective of social work is to make social work unnecessary and to put the social worker out of his job." Unfortunately, the usual index and bibliography are missing.

FREDERICK E. LUMLEY

* * *

Determining Essential Apparatus

[*Continued from page 177*]

States. Prices of science apparatus like other commodities fluctuate, but the inclusion of the average price on each item as furnished by the leading equipment companies should serve as a reliable guide to apparatus purchasers. This study, as already stated, has been undertaken primarily for the purpose of making a revision in the apparatus lists prepared by the Ohio Department of Education for the 1,293 public high schools in the state.

NEW TESTS

THE Powers Diagnostic Latin Test has recently been published by the Public School Publishing Company, Bloomington, Illinois. The test is designed to measure the extent to which pupils in first-year Latin have mastered the vocabulary, word forms, and translating skills necessary for a good foundation in the subject. It is broken up into parts so that a separate score is obtained on English-Latin translation, nouns, adjectives, verbs, vocabulary, comprehension and syntax, and derivatives. Each of these parts is reliable enough to be used for diagnosis so that certain points of weakness in the preparation of the pupils may be determined directly from the test scores. Whether these parts include all of the major sources of difficulty in mastering first-year Latin is not shown by the author of the test. This should be an essential criterion for validity.

ANOTHER attempt to develop a test for predicting success in modern language is the Luria-Orleans Modern Language Prognosis Test, published by the World Book Company, Yonkers-on-Hudson, New York. In essence, this test is a series of lessons in Spanish and French, each followed by a test to determine what the pupil has learned in the lesson. The importance in guidance of evidence of the probable success of individual pupils in various school subjects is apparent. Much of our guidance work now is based upon predictions of greater or less accuracy. Previous school marks and intelligence-test scores are used most widely as a basis for this prognosis.

Recently, specific tests helpful for prediction have been constructed and are in use. The Luria-Orleans test was first constructed in 1924, and was again tried out in 1928 with 110 French students in one of the New York City high schools. The value of the test for prognosis has been determined by correlating the test results with the grades received by these 110 pupils giving a coefficient of correlation of .68. Since its preliminary use, two new parts have been added so that it is probable that the predictive value of the test may approach .70 to .75. This is by no means high enough to be used alone

as a basis for forbidding pupils to study foreign language, but it does give useful evidence of the probability of success which pupils and guidance officers will both find helpful.

The chances of success are very much greater for those students who make a high score on a prognosis test than for those who make a low score. The test should be used in combination with intelligence tests and various rating scales of essential scholarship traits so that a more valid prediction may be possible.

A Test Book to Accompany Introduction to Science has been prepared by O. W. Caldwell and F. D. Curtis and published by Ginn and Company, Boston. The book has been designed to provide a comprehensive testing program in central science, and parallels the topics treated in the textbook by the same authors. No evidence has been presented to indicate the validity or the reliability of the tests, but an examination of the book indicates clearly that most of the test items are items of information. There are very few attempts to measure the student's ability to interpret scientific data or to apply principles to new situations. In so far as these are vital objectives of science teaching, the test book is likely to be a danger to those teachers and pupils who determine the emphasis in teaching and studying by the types of examinations used. So far as the objectives which are being measured are concerned, the tests will stimulate study on the part of the pupils and provide a continual basis for diagnosis for the teacher. It is true that for the testing movement to be of greatest value to teachers and pupils alike, tests which are extensive enough and repeated frequently enough to provide an evaluation of teaching and to indicate the emphasis needed to make teaching more effective are clearly needed. We need, however, to be sure to recognize its important objectives which are not being tested so that they will not be neglected in any intelligent program of instruction.

R. W. Tyler